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UNITED STATES DEPARTMENT OF AGRICULTURE

FOREST SERVICE

FOREST RESEARCH ACTIVITIES

FOREST MANAGEMENT
WATERSHED MANAGEMENT
FOREST PRODUCTS

FOREST ECONOMICS
RANGE MANAGEMENT
FOREST SURVEY

APRIL 1937

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FOREST RESEARCH

MONTHLY REPORT

April, 1937

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MONTHLY REPORT

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GENERAL

Allegheny

Advisory Council. The Council's Committee on Coordination of Research held two sessions at Harrisburg, Pennsylvania, prior to the meeting of the Allegheny Section, SAF. At each session the meeting split into two groups for intensive consideration of the research needed in different fields. Wildlife in forest management, forest economics, artificial forestation, and fire, were selected for discussion on the basis of the importance attached to them by the Committee a year ago. Should funds become available to any agency for a new line of work in the territory, such as zoological studies, the committee's recommendations would be invaluable in drawing up a program for it.

Cooperation and Public Relations. Forbes attended the second meeting of the General Wildlife Federation, held in St. Louis. He helped arrange a caucus of the Pennsylvania delegation (some 15 representatives) which appointed a three-man committee to proceed with the organization of a Pennsylvania unit of the Federation. The Pennsylvania Board of Game Commissioners is urging an appropriation for the Bureau of the Biological Survey for research at the Allegheny Station.

At the request of the Regional Forester the Station offered suggestions to the State forestry departments for a five-year ECW program; these included intensified records of the demonstration plots already approved for establishment on private land under the ECW program, and systematic observations of frost penetration, snow depth, and soil moisture conditions on State Forests. The Station also drew up a program of improvements, including road construction and maintenance, for each of our Branch Stations, to be submitted to the State or Federal officials responsible for CCC activities at those points. Such provision for the construction and the maintenance of improvements is particularly important at those of our Branch Stations which for one reason or another cannot be given National Forest status.

California

"Show Me" Trip for Radio Men. Because of the interest in forestry in the Western Farm and Home Hour broadcasts from San Francisco and the participation in that Hour by the Experiment Station and the Regional Office, a "show-me" trip was arranged for Wallace Kadderly, Western Radio Program Director for the Department, and Jennings Pierce, Western Agricultural Director for NBC. They were accompanied on the inspection trip of the San Joaquin Experimental Range, the Kings River Influences Project, and the San Dimas Experimental Forest by Hill and Spencer Munson.

Central States

Cooperation. (Arkansas). The Arkansas Legislature has authorized the establishment and development of a branch field station in northeastern Arkansas where the State Agricultural Experiment Station may conduct studies and demonstrations of the use of typical Ozark hill-lands for livestock production and for forestry. The Central States Forest Experiment Station was requested to cooperate in the selection of a site for this field Station, and accordingly Baker spent April 15-19 with the committee from Fayetteville inspecting proposed areas of approximately 2,000 acres.

Intermountain

Intermountain Laboratory. With the opening of the 1937 field season the laboratory of the Intermountain Forest and Range Experiment Station at Ogden is clearing the decks for another busy year of analytical work. During the past year more than 2,000 samples of forest and range soils and 60 samples of range plant material were subjected to test tube analysis.

Most of the laboratory work during the past year, as is indicated in the tabulation below, involved the analysis of soils in connection with erosion surveys but many other analyses were made also.

Summary of Soil and Plant Analytical Work During 1936

Purpose of Analysis	No. of samples
Soils	
1. Fertility losses from erosion, Wasatch mountains, Utah	1,000
2. Fertility losses from erosion, Granitic soils, Idaho	750
3. Range - Erosion - Soil Fertility Survey, Ephraim Canyon	110
4. Effects of sagebrush burning on range soil fertility	160
5. Relative soil fertility study for artificial reseeding	150
6. Soil moisture relationships and pine seedling survival	60
7. Region 4 forest nursery site soil studies	60
Plant Material	
8. Soluble salts in range plant leaves	45
9. Location of minerals in ponderosa pine needles	16

It is estimated in excess of 6,000 separate analyses were made in the laboratory in connection with the handling of the samples listed above. Nearly all of the soil samples were analyzed for at least three separate determinations -- the more common of these being mechanical analysis, moisture equivalent, total nitrogen, organic matter content and pH reaction, while some were tested for total and available phosphorous. The plant material tests generally involved

Intermountain (Continued)

four separate determinations including phosphorous, calcium, magnesium and potassium, while some were tested only for soluble chlorides and sulphates.

The satisfactory handling of this comparatively large volume of work during the year by one trained technician and an assistant is due largely to the availability of the modern apparatus with which the laboratory is equipped and to the standardization of methods for carrying on the various determinations. The efficiency of the laboratory is indicated in the following tabulation which shows the average numbers of samples for any one determination that can be run in one day by one trained man and an assistant.

Average Daily Capacity of the Intermountain Laboratory

Soil Determinations	Samples per day	Soil Determinations	Samples per day
Reaction pH	50	Phosphorus	4
Mech. analysis	30	Calcium	4
Total nitrogen	24	Magnesium	4
Available phosphorus	20	Potassium	4
Moisture equivalent	16	Soluble chloride	2
Organic matter	15	Soluble sulphate	2
Total phosphorus	2		

In addition to the facilities for handling mechanical and chemical analyses of soils and chemical analysis of plant material, a new unit has been added to the laboratory recently for conducting soil bacteriological studies.

Northeastern

Personnel. Halsey M. Hicks of the Forest Survey unit at the Southern Forest Experiment Station was transferred to the Northeastern Forest Experiment Station, reporting for duty on April 19. His first assignment is to the Bartlett Experimental Forest in New Hampshire where he relieved Mr. Cunningham who transferred to the Chenango Experimental Forest in central New York State to open up planting activities there.

Grouse Nesting and Survival Study. The New England cooperative grouse nesting and survival study was launched during the month, with branch stations at Gale River, Massabesic, Bartlett, Hopkins, and Chenango Experimental Forests. In addition, a number of other agencies are also cooperating. Work this year is chiefly designed to develop a feasible system for use in the future, which will give annually a regional picture of grouse nesting conditions and brood survival.

Northeastern (Continued)

Wildlife observations from Bartlett and Gale River in 1935 and 1936 are being summarized to obtain seasonal use of forest types and the populations present during the period. All branch stations will be visited by July 1 for the purpose of preparing my plan of work for the 1938 fiscal year. This work plan will center around the correlation of woods operations in various types and the effects on game management.

Pacific Northwest

Regional Investigative Committee. The annual Regional Investigative Committee meeting was held April 16. It was attended by 35 from the Regional Office, cooperating bureaus, and the Station. The accomplishments of the past year were reviewed and the projects for the coming year were critically discussed before recommendation.

FOREST MANAGEMENT

SILVICULTURE

Allegheny

Management; Birch-Beech-Maple-Hemlock. Turberville has finished checking the final age counts for all of the material obtained from the ten Tionesta virgin timber plots, except for a few sections which could not be relocated in the office for check countings, and which will have to be duplicated in the field. Although ring patterns, such as used by Douglass and others in the West, have been extremely useful in correcting some major errors in counting sections from extremely suppressed trees, they evidently cannot be wholly relied upon in a mesophytic forest. In other words, a small proportion of the age counts necessarily remain somewhat unsatisfactory.

Of Downs' two articles on the glaze storm of March, 1936, in Pennsylvania and New York, that covering the meteorological aspects was reviewed by the local office of the Weather Bureau and submitted to the Monthly Weather Review; that on silvicultural aspects was completed, but may require slight revision following some additional computations of the original data, now under way.

The establishment report in the permanent plot study of natural reproduction as influenced by deer and rabbits was completed, and is already in some demand outside the Forest Service.

Principal findings in the thinning studies begun two years ago at Kane, and in the weeding study completed last field season, are being incorporated in two articles by Hough, another by Ostrom, and a couple of technical notes by the same men.

Allegheny (Continued)

Ostrom has compiled the history of all work done so far on this project, as a basis for a revision of the master working plan.

Hough completed in rough draft an article on "Major life zones, forest formations, and tree associations of the Allegheny Section territory", which is an outgrowth of his work as chairman of the Type Committee of the Allegheny Section.

Management; Oak-Pine. By the concerted efforts of three members of the Station staff, two from the New Jersey Department of Forestry, and large numbers of CCC and ERA men, the 80 acres of controlled burning plots were laid out, tallied, and burned. Although the area burned 67, 57, 41, and 32 years ago, as determined from fire scars on stumps removed from the fire line, it has been free from fire since 1905. Although the controlled fire was started after 6 o'clock on a day of very high winds, by 9:30 it was impossible to keep the fire going. A second burn, 3 days later, was found necessary to consume accumulated debris uniformly; even then much remained unburned in places. Seger cones, calibrated for 600-1200 degrees Fahrenheit, were set on the surface throughout the parts to be burned. After the second burn some of the 600-degree cones were found with the apex bent and a few of the 800-degree cones were glazed. Dr. J. S. Joffe of the New Jersey Agricultural Experiment Station is directing cooperative soil studies in the area, and Dr. J. M. Fogg and E. T. Wherry of the University of Pennsylvania have taken considerable interest in ecological aspects of the work.

Wood completed incorporating the final data from his seed beds on the Lebanon Forest in his manuscript describing the factors responsible for the failure of oak generation in southern New Jersey. He and Little have completed the first draft of a paper on sprouting of oak in the pine conversion plots, where vigor of sprouting is considerably influenced by the degree of thinning.

Pruning and Thinning; Loch Raven Plantations. This special ECW study was completed in the field during March, and the office analyses are being pushed. The working plan for the pruning study, which involves a number of important points in design of experiments, was discussed in detail at a special staff meeting of both Forest Service and BPI men.

Central States

Farm Woodlands. Early in the month Diller and Page remeasured the hop-hornbeam sprouts in Indiana which resulted from the August and September cuttings made at nine different stump heights during 1933. The analysis of data for this study is nearing completion and will be submitted for publication during the summer.

Central States (Continued)

Diller spent one week planting trees, chiefly red oak and white ash, in a previously grazed open-park woodland with the purpose of re-establishing a growing stock of desirable species. On the basis of conclusions reached in the farm woodland grazing studies to date, it appears that artificial methods must be employed in most woodlands in the open park or final stages in order to obtain satisfactory growing stock. In the program of work for farm woodland management, the study of artificial regeneration will be given consideration.

Oak Sprout Study. A 50-page typed report on "Sprout Oak Stands in the Ozark Uplands", based upon the 1936 field work of Dr. Franklin G. Liming and Paul F. Hursey, was completed and distributed to the Washington office, the R-9 office, the Forest Products Laboratory, and to the Forest Supervisors in Missouri, for comment. Because of the observational and preliminary character of this report and the large number of illustrations, only a limited number of copies were distributed at this time. The report provides the Station with a better idea of the present condition of the oak stands in the Ozarks, presents the outstanding problems of silvicultural management, suggests needed investigations, and invites stimulating thought by agencies and individuals concerned with the management of sprout stands.

Lake States

Upper Peninsula Experimental Forest. The working plan for the sustained yield management of the Upper Peninsula Experimental Forest has been completed. The area to be managed consists almost entirely of northern hardwoods, with a scattering of swamp and other minor types. For purposes of management the forest is divided into a large number of small natural units. Although any single cutting operation will cover from 1 to 6 of these units, the records will be kept separately for each. The semi-permanent sample plots established during the inventory survey will be used as the basis for intensive studies of growth and development of individual trees; the cutting units as a whole will be kept under observation for mortality and volume growth.

Northeastern

Soil Fauna. The analysis of the microarthropods of a square foot sample (35F1) of mountain laurel duff from the southern Appalachians (an old burn) was completed. It yielded 25,706 animals, of which 20,415 were so-called saprophytes. Of the various groups,-- 18,778 were mites; 6,318 were springtails; 360 were proturans; and 114 were micromillipedes. This is the largest number yet recorded for America. Of the "saprophytic" mites there were 109 different species. This is by far the highest number of species yet recorded for a sample of similar size either here or in Europe.

Northeastern (Continued)

It thus becomes evident that such a root duff harbors a very varied and extensive fauna.

Northern Rocky Mountain

White Pine Cut-Over Plots Show Volume Loss. A consistent loss in net volume of the residual stand after logging was shown by recent analysis of nine permanent sample plots representative of cut-over conditions in mature to overmature western white pine stands (160 years and older) on the Kaniksu Forest. Volumes per acre left at time of cutting and the volume ten years later for the nine plots are shown below:

Plot number	Volume per acre		Net gain or loss
	Residual stand after cutting	10 years after cutting	
	Cubic feet	Cubic feet	Percent
119	2,296	1,955	-14.8
120	3,585	1,285	-64.2
121	2,884	1,573	-45.5
134	1,047	762	-27.2
135	2,654	2,395	- 9.8
136	2,008	1,859	- 7.5
137	3,294	3,517	+ 6.8
138	2,279	2,266	- 0.6
146	3,612	2,782	-23.0
Average	2,629	2,044	-22.2

Only one plot showed a net gain. The average loss, taking into account growth made by surviving trees, for all plots was 22.2 percent.

Loss by species, all plots combined, was as follows:

Species	Composition of residual stand left after cutting	Net gain or loss in 10 years after cutting	Growth per year of trees surviving 10-year period
	Percent	Percent	Percent
Western white pine	37	-15.8	1.5
Western larch	1	-12.1	0.7
Douglas fir	1	- 5.4	1.9
Lowland white fir	8	-13.1	3.1
Western hemlock	37	-35.5	1.5
Western red cedar	16	-11.9	1.4
Total or average (weighted)	100	-22.2	1.6

Northern Rocky Mountain (Continued)

Growth made by trees that survived the 10-year period is shown in the last column of the above table. As shown, these trees made fairly good growth, averaging 1.6 percent per year of the volume of these trees at time of cutting. This is a good growth rate for mature stands. It is very obvious, however, that the heavy mortality of these plots has much more than offset growth made by surviving trees.

Mortality was recorded annually on these plots and the cause of death determined as accurately as possible. The following summarizes mortality by species and by cause, all diameter classes combined.

Species	Cause of death						Total
	Fire (slash burning etc.)	Logging injury	Wind	Beetles	Miscel-laneous	Unknown	
	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Western white pine	8	6	41	17	8	20	100
Lowland white fir	22	9	8	19	15	27	100
Western hemlock	29	8	30	8	13	12	100
Western red cedar	23	8	51	2	5	11	100

Fire, wind and beetles were the principal agents to which mortality could be definitely ascribed. The large loss of white fir and hemlock from fire can be largely accounted for by the fact that in slash burning little effort was made to save trees of these species.

These figures substantiate and give factual basis to the frequent observation that old white pine stands have a tendency to go to pieces rather rapidly after partial cutting.

Pacific Northwest

Douglas Fir Region. During the first week of April the Wind River Experimental Forest headquarters was opened for the season with Junior Forester Meagher as resident officer. Earlier in the season our new headquarters building was used by the Rangers Training School.

ERA work is again under way with a crew of 20 men doing stand improvement, trail construction, and similar work.

Early in the month Kolbe and Isaac made a trip to Wind River to look after the annual transplanting at the Wind River Arboretum. This

year a half-dozen new species were added to the arboretum, which now contains in the neighborhood of 150 species, mostly evergreens. The worst snow damage since the arboretum was established in 1914 occurred during the past winter.

In past years soil storage tests of Douglas fir seed indicated that most of it germinated or decayed within one year after falling, and last fall a new series of tests were started including the other important timber species of the Northwest. The first-year germination test of these seeds is now in progress in the greenhouse at Wind River.

At the Cascade Head Experimental Forest, in the spruce-hemlock type, the year-long work of the ERA and Resettlement improvement crews was uninterrupted. The ERA crew under the direction of Junior Forester Nance has established several sample plots in thinning, pruning, and stand improvement in red alder; also experimental plantations of black walnut, black cottonwood, Port Orford cedar, redwood, Monterey cypress, and cascara were established. The cascara was interplanted with Port Orford cedar and Douglas fir with the intention of using it as a nurse tree and removing it at the approximate age of 20 years for thinning and early revenue. At the new headquarters a beginning was made in the establishment of nursery plantings; this development will be limited to testing such tender species as cryptomeria and Chilean cedar that will not stand the Wind River nursery climate.

Methods of Cutting in Ponderosa Pine. Early in the month Brandstrom, Carlson, McKay, and Kolbe began marking for cutting the seven Pringle Falls plots. The trees on the plots had previously been classified as to vigor and log-grade and an estimate had been made of their present value and future growth. The cutting is to take out from 20 to 80 percent of the volume in trees 16 inches and larger on the seven areas. The timber to be cut was advertised for sale late in the month.

Physical Factor Study at Pringle Falls. Tabulation of the physical factor records taken at the Pringle Falls Experimental Forest in 1935 and 1936 was started by Field Assistant McKay. This phase of the major management project in the ponderosa pine type will receive more attention this coming field season than in past years. The records considered so far reveal that during the summer soil temperatures at the 6-inch level are about 3 1/2 degrees higher in the open ponderosa pine stands than in the dense lodgepole stands, and that the range in temperature at this level is about 10 degrees in the lodgepole pine and only 6 degrees in the ponderosa pine. At both sites soil temperatures reach their minimum near high noon and their maximum at about midnight.

Pringle Falls Experimental Forest Bench Marks. In 1935, 16 permanent bench marks on the experimental forest were established in conjunction with the ECW cruising and timber-mapping project. The field notes were sent to the U. S. Coast and Geodetic Survey for checking and

adjusting. Photostat copies of the final computation sheets just received indicate that the Pringle Falls elevations are to third-order accuracy and are now in the official records. These elevations and the U.S.C.G.S. triangulation point on Pringle Butte, also established in 1935, all help to put Pringle Falls on the map.

REGENERATION

Allegheny

Mycorrhiza. Upon Dr. Doak's decision to undertake nursery inoculations in the mycorrhiza project, plans were developed for resumption of Forest Service cooperation. After carefully considering with Forbes and other members of the Forest Service staff the facilities and personnel available, Dr. Doak decided on the Lebanon Branch Station for the work of this and perhaps a second season, after which the work may be extended to other Branch Stations. The general plan is to employ about 6 nursery beds, approximately 21 feet square, each containing sixteen 4 x 4-foot plots. Seed of two species of major importance to artificial forestation in south Jersey - probably pitch and shortleaf pine - will be sown, and half of the plots will be inoculated with soil fungi known from previous experimentation to form mycorrhizae on the roots of these pines. Two of the large beds will be used to compare the behavior of seedlings under one-half and one-quarter shade; two to compare the effect of organic and inorganic nitrogenous fertilizers; and two to compare the effect of organic and inorganic fertilizers supplying other elements essential to seedling development. Some seedlings will be removed from the plots about 4 times during the season, at 3-week intervals, and root cultures will be made immediately to re-isolate the fungi used in their inoculation and to identify other fungi native to the sites. The number of mycorrhizal short roots will be counted currently, or the material will be preserved for later counts.

During the first season this set-up will take about half of the time of Wood, and in the second season, due to the increased size of the seedling root systems, nearly his full time.

A nursery site immediately adjacent to the headquarters has been selected, and with the help of our Junior Assistants to Technician and an ERA crew the work is already well advanced. Some extra space is being cleared in order to take care of expansions. The BPI is prepared to install the necessary facilities for artificial watering. The seedlings will remain in the nursery beds for two years, and those not removed for analysis in the course of the experiment will be out-planted for further observation.

Allegheny (Continued)

Forest Planting; Birch-Beech-Maple-Hemlock. Before returning to the Allegheny National Forest on February 15, Junior Forester Hetzel completed in rough draft his report on the cooperative study of plantations on the Allegheny National Forest and of the Armstrong Forest Company. The Station has recommended some slight modifications, but because Hetzel is already assigned to other work, will probably mimeograph a limited edition of the report much as it stands.

Forest Planting; Oak-Pine. Released cuttings in the Camp Ockanickon interplantings were made by an ERA crew. The oak seedlings remaining in the experimental beds on the Lebanon were planted in openings on isolation strips of the stand-conversion plots, and a few silver maple seedlings available at Beltsville were planted in natural openings on poorly drained St. Johns stands on the Lebanon Forest, where hardwoods have possibilities both in fire-break establishment and in soil building.

Phenological observations, particularly of pine seedfall and seedling germination, were continued by Junior Forester Little.

Appalachian

Planting Experiments. Minckler has made considerable progress toward the setting up of a research program for the Station's new planting project.

The Forestry Division of the T.V.A. is much interested in cooperating with the Station in a group of planting experiments, and Minckler spent a week in Norris looking into the possibilities of such investigations. As a result of this inspection six planting experiments have been tentatively designed for T.V.A. land. In late summer or early fall the blocks and plots will be laid out and the planting done in the spring of 1938. It is anticipated that the planting will be continued for four or five years.

Progress has also been made on the development of a new and statistically valid method of plantation examination, and the evaluation of the present method. G. Varney, of Region 7, met Minckler on the Monongahela National Forest late in the month and two plantations, one of 13 acres and one of 80 acres, were laid out for the experiments. On each area three methods of examination will be used: regular staked rows, as now practiced; a statistically valid method of staking; and a statistically valid method of dispensing with staking of trees or rows. This will be replicated over several years and on different plantations, and, if possible, on other National Forests.

California

Firebreak Planting. Examination of the six succulent plots installed on firebreaks on the San Dimas Experimental Forest show the following results:

Species	Number planted	Percentage still living					Av. Min. Temp.	Av. Max. Temp.	Cause of death
		July 1936	Oct. 1936	Jan. 1937	Mar. 1937	Apr. 1937			
Mesembryanthemum roseum	1200	79.0	72.3	16.4	0	0.1	18°F.	116°	Low temp.
" tenuifolium	1200	70.4	52.6	10.0	0	0			" "
" croceum	1200	47.8	28.7	24.2	8.9	8.5			" "
" lehmannii	1200	39.5	21.3	15.4	0	0			" "
" edule	1200	79.8	75.5	10.0	0.3	0.3			" "
"aequilaterale	200	80.0	64.0	6.5	0	0			" "
Stomatium agninum	200	74.5	38.5	25.0	7.5	7.5			Erosion°

°Plot has 50 percent slope; many plants washed out or completely covered with eroded soil.

Central States.

Direct Seeding. Counts on 1,320 walnut seed spots in Vinton County, Ohio, treated with seven materials, chosen as rodent repellents, revealed a failure, inasmuch as squirrels had destroyed 1,306 of the spots. Other seed spotting areas in Vinton Country were reseeded in April with the same species used last year -- shortleaf, pitch, and Virginia pines. The outcome of direct seeding is again to be tested on north and south aspects and under three ground conditions -- in the rough, in furrows, and on plow ridges.

Forest Planting. Most of April was spent by Chapman and Cummings in establishing experimental plantings. Twenty-eight plots were selected in southeastern Ohio by randomization, surveyed and staked, preparatory to planting. Planting was completed on April 23. Twenty of the plots, of about one-tenth acre each containing 256 trees, will test comparative behaviors of 1-0 and 2-0 stock of shortleaf and pitch pines (1) under Danthonia cover, Andropogon cover, on recently plowed field, and on "spoil banks"; (2) for north and south aspects; and (3) for upper and lower slopes. Eight plots will test fertilizing effects on six species, shortleaf pine, pitch pine, white pine, yellow poplar, white ash, and black locust, on north and south aspects. Plots were replicated for each set of planting conditions. In addition to the randomized plots, other age-of-stock and fertilizer demonstration areas were planted with a total of 17,000 trees.

Nurseries. On April 12, test beds were seeded at the Forest Service Nursery at Vallonia, Indiana, to demonstrate any differences in behavior of seedlings which may develop from fall and spring-sown seed. Seed of yellow poplar, shortleaf pine, pitch pine, and Virginia pine from comparable sources were used in both fall and spring seedlings.

Central States (Continued)

Plots were established in fall-sown seedbeds for preliminary tests of comparative values of mulching materials. At this time areas mulched with burlap show two or three days earlier germination, higher germination, and much more uniform germination than those areas mulched with either straw or hardwood leaves. These and some additional mulching materials will be further tested on more nursery areas.

Site Requirements of Yellow Poplar. Much of Auten's time during April has been devoted to the report of yellow poplar site requirements, the field data of which were gathered during the 1936 season.

Apparently yellow poplar is not so demanding in its requirements for mineral elements in the soil as has been assumed. The fastest growing poplars were found in the residual sandstone areas whose soil fertility level is as low as any in the region. Some plots with average annual height growth of 3 feet were on soil too low in potassium to give a test and so low in phosphorus as to be near the minimum amount detectable by the color method. One phenomenon appeared without exception: very large amounts of calcium deposited in the surface soil horizon by yellow poplar litter.

Out of 78 plots taken at random wherever poplar could be found, only 6 were on soil which had drab or gray-mottled subsoil, and 3 of these had been planted. Yellow poplar cannot thrive on a tight, poorly drained soil.

Perhaps the most promising development of the study is the probability that site quality for yellow poplar may be evaluated from the depth of the A_1 soil horizon in the original soil profile. A highly significant relationship exists between depth of organic matter penetration and poplar growth. For planting operations this index should be invaluable. It is nearly always possible to find a bit of the original soil profile along a fence or in an adjacent tract of undisturbed woods. Evidence is very strong that it is useless to plant yellow poplar on any site whose original A_1 soil horizon is less than one inch deep or on any soil which has a tight subsoil, especially if it is gray or mottled with gray.

Lake States

Reforestation. The Station's expanded program of nursery research has been started at the Rhinelander and Hayward nurseries in Wisconsin. Several large-scale experiments designed to test fertilization practices, densities of sowing, and root pruning have been layed out. These experiments have been set up according to the factorial design, and the results should give valuable information on experimental technique as well as on the main questions to be answered. Some phases of the nursery work will be carried on also at the Chittenden nursery in Michigan.

Lake States

Field plantings of jack pine, Norway pine, white pine, and white spruce are also being carried on on the Nicolet Forest in connection with the nursery studies. The purpose of these is to determine the class of planting stock that will give best survival. One series of plots will be laid out on the Oconto District on a light sandy soil, and two on the Peshtigo District on heavier soils. On the Oconto District two sites, one open and one with partial aspen cover, will be planted to a number of species and age classes. Another pair of sites will be planted with 2-0 Norway pine graded into several classes on a size basis. On the Peshtigo District similar tests will be made, using different species.

Results of recent drought tests indicate that seedlings produced from jack pine seed of greater than four years' age are inferior to those produced from newer seed. Several large-scale tests have been made in the drought machine and the results agree very well. The present machine, which accommodates 200 plants at a time, produces results which are capable of being analyzed more rigidly than was possible with the older machine which had a capacity of only about 30 plants.

Spring vs. Fall Planting. The Station has just completed the analysis of an administrative planting study carried out on the Superior National Forest. The most important finding was that on the Superior, spring planting is decidedly more favorable than fall planting. The survival of fall planted trees (2-0 Norway pine) was 41 percent as compared with 73 percent for spring planted trees.

Season of plant.	Soil			Ave.
	L	M	H	
Spring	70	71	85	73
Fall	44	46	28	41

The interaction of soil and season of planting was also significant. The spring planted trees survived best on heavy soil (colloidal content over 30 percent) and fall planted trees made the best showing on light soil (colloidal content less than 15 percent).

Northeastern

Browse Damage to Plantations. I. H. Sims, accompanied by John Pearce, conducted a damage study on a series of methods of planting plots established on the New Haven Water Company land near North Branford, Connecticut. A previous cursory examination had shown what appeared to be damage by browsing. The damage apparently was done by deer, as evidenced by the manner in which the twigs were broken, tracks, and other signs of deer in the vicinity of the plots. The Norway pine plots all showed rather extensive browsing which, however, did not

Northeastern (Continued)

result in real injury to the trees. The deer quite obviously took a nip at the terminal needles, biting them off just beyond the bud. This form of browsing was not recorded, but the general impression was that approximately 25 percent of the trees showed this type of injury.

There seemed to be little rhyme or reason to the browsing other than the differences clearly evidenced between species. White pine was obviously the hardest hit, and was followed by red pine and the spruces. The spruce was practically immune. The most extensive and serious damage occurred in the white pine plot.

Juniperus communis and Juniperus virginiana, present on the area, were both generally but slightly browsed. No specimens of either of these species was observed, which had escaped browsing. Hardwoods and shrubs, in general, were very lightly browsed, sumac being the only species which showed very clear evidence.

Southern

Plantation Directory. J. C. Joiner reported April 16 for work on the descriptive directory of plantations, the foundations of which were laid in 1931-32. The main purpose of this directory is to preserve complete, authentic records of establishment of a great number of the older plantations throughout the Station territory, and in some instances beyond, as a basis for the plantation yield tables that will almost inevitably be demanded some years hence. Other Stations (notably the Northeastern, Lake States, and Central States) have undertaken growth and yield studies in the older plantations in their territories, but have encountered a serious handicap in lack of establishment records, including especially records of seed source, class and age of stock, site preparation, and early treatment. The Southern Station's undertaking is more fortunate in some ways, as most of the plantations in its territory have been established since 1926, with stock from nurseries that have kept records of seed source year by year. In many instances the man who established the plantations can still be interviewed, and can amplify the written records kept by State agencies. The Station has more or less complete records on several hundred such plantations, and Joiner's assignment is to visit these and such other plantations as he can find, verify the records, and locate each plantation by an autolog and a land description sufficiently precise to identify it beyond doubt in future years.

Seed Studies: Longleaf Pine. Laboratory and field germination tests of the longleaf seed lots in the overwinter storage tests were completed during April. The seed was placed in storage December 30 after dewinging half of the seed in the regular nursery dewinger, and drying half of each resulting lot in open trays in the extractory boiler-room for 3 or 4 days. A germination test of seeds from each

lot set up December 31 gave the following averages for the four major subdivisions:

Condition of wings	On		Mechanically removed	
Approximate moisture content (percent)	22	9	22	9
Mean germination percentage, 2,000 seeds	77.3	68.8	75.6	65.1

The following table shows the results of tests of 250 seeds from each method of storage, in 10 randomized balanced blocks in (a) the laboratory, (b) the W. W. Ashe Nursery, and (c) the Stuart Nursery. In the laboratory each block consisted of 4 standard peat mats, in covered glass dishes piled one upon another, with order interchanged at each examination; the germination percentage is the total at the end of 30 days. In each nursery, each block consisted of a strip of bed 2 by 16 feet; the percentage given is the total seed germinated and actually rooted in the ground on the 30th day. The results are arranged in order from best to worst on the basis of the laboratory test.

An analysis of variance of the germination tests made when the samples were placed in storage showed very significant differences had developed as a result of moisture content, and mechanical treatment (dewinging), and that even during one week of storage there was a significant interaction between moisture content and container. The freshly extracted seed at high moisture content germinated somewhat more completely, and much more promptly, than the seed dried to approximately 9 percent, a fact which argued against the moist seeds' keeping well in storage. This was confirmed by an analysis of variance of laboratory and nursery germination tests after 2 1/2 months' storage, in which moisture content was found to be by far the most significant factor affecting keeping quality. Among the interactions, those of moisture content with container, moisture content with environment, and moisture content with container and environment, were most significant. Environment alone, container alone, and mechanical treatment alone were also very significant. Most interactions were very significant or significant, except that several of those involving mechanical treatment failed to show significance in nursery tests.

Southern (Continued)

Order	Wings	Approximate moisture content when stored	Environment	Container	Percentage on 30th day		
					Laboratory[1]	Ashe[2]	Stuart[2]
		Percent					
1	On	22	Refrigerator[3]	Glass[4]	79.6	78.4	80.0
2	Off	22	"	"	72.4	40.8	55.2
3	On	22	"	Cloth[5]	72.0	71.6	73.2
4	On	9	"	Glass	71.2	65.6	68.4
5	Off	22	"	Cloth	70.8	64.0	60.8
6	On	9	"	"	70.0	76.4	64.4
7	On	9	Can[6]	Glass	68.0	69.2	72.8
8	Off	9	"	"	67.2	59.6	60.4
9	On	9	Bag[7]	"	66.8	65.2	67.6
10	Off	9	Refrigerator	Cloth	64.4	61.2	56.8
11	Off	9	Bag	Glass	64.0	56.8	59.2
12	On	9	Shelf[8]	"	61.6	68.4	66.8
13	Off	9	Refrigerator	"	59.6	60.0	70.0
14	On	22	Bag	"	56.8	6.0	0.0
15	Off	9	Shelf	"	54.4	52.4	66.4
16	On	22	"	Cloth	53.6	55.6	62.8
17	On	9	"	"	52.8	51.2	59.2
18	Off	22	"	"	51.2	39.4	47.6
19	On	22	Bag	"	50.0	59.2	53.2
20	On	9	"	"	43.6	50.0	58.8
21	On	22	Can	"	41.6	30.4	42.8
22	Off	9	Bag	"	40.4	36.0	44.0
23	Off	22	"	"	37.6	42.0	38.0
24	Off	9	Shelf	"	36.4	37.6	38.4
25	On	9	Can	"	29.2	24.0	28.4
26	Off	22	"	"	20.8	24.0	26.0
27	On	22	"	Glass	16.0	1.2	0.0
28	Off	9	"	Cloth	7.6	11.6	6.4
29	Off	22	"	Glass	1.2	6.8	0.0
30	On	22	Shelf	"	0.4	2.8	0.4
31	Off	22	"	"	0.0	3.2	0.0
32	Off	22	Bag	"	0.0	3.2	0.0

1/ Final germination percentage.
2/ Percentage germinated and rooted.
3/ At 38° F.
4/ Sealed 1-quart jar.
5/ Small cheesecloth sack.
6/ Galvanized-iron ash can filled with dewinged seed at approximately 22 percent moisture content; in nursery storehouse.
7/ Two-bushel burlap, filled with seed at approximately 22 percent moisture content, with wings on; in nursery storehouse.
8/ Open, near top of room in nursery storehouse.

Southern (Continued)

Laboratory germination tests varied from 79.6 percent to 0.0 percent. In general, cold storage, or low moisture content (initially, or attained by drying through cheesecloth not in contact with wet seed), or both, proved the most satisfactory means of storage. Nursery germination percentages checked laboratory tests remarkably closely except in three instances (the 2d, 14th, and 27th on the list), in which moist seed (dewinged in the sample from the refrigerator) appears to have been in unstable condition and to have deteriorated during shipment to the nursery, or under the less favorable germination conditions encountered in the field.

The importance of the results is emphasized by the following table, showing the cost per thousand longleaf trees for seed alone at various tree percents attained in the nursery, with longleaf seed at the rather common price of $1 a pound.

Tree percentage	70	40	10
Cost of seed per M trees produced	$.36	$.63	$2.50

On this basis, with a planting program of 20 million longleaf seedlings, the average germination percentage of the poorest quarter of the storage lots, as against the average of the best quarter, would involve a waste of approximately $42,800.

MENSURATION

Allegheny

Volume Measurements, Loch Raven Plantation. Stem analyses of 73 white pines and 36 yellow poplars should provide the basis for determining significant differences in form between forest-grown and plantation-grown trees, inasmuch as volume tables are already available for the former.

California

Cubic-Foot Volume Table Check. Check of a cubic-foot volume table for red fir (Abies magnifica) made by the alinement chart method of Demeritt and McIntyre 1/ appears to support Reineke's criticism 2/ that

1/ Demeritt, D. B. and A. C. McIntyre. A simple method of constructing tree volume tables. Jour.Agric.Res., vol.44, no.6, p.529-539. 1932.

2/ Reineke, L. H. Discussion of Demeritt and McIntyre's method of constructing tree volume tables. Jour.For., vol.33, no.4, p.412-418. 1935.

California (Continued)

the main test of accuracy used in the method is fallacious and by its nature may indicate a satisfactory table even though the table may fit the data poorly.

In the present instance the table was apparently satisfactory according to the standards set up in the method. However, the deviations of tabular volume with diameter and height showed that considerable residual variation was still associated with these two factors. A slight, but definite trend was evident with diameter and a very strong correlation with height, as shown in the following table.

Deviation	Height - Logs												
	1½	2	2½	3	3½	4	4½	5	5½	6	6½	7	Total
in %	-16.4	-12.5	-1.3	-10.1	-7.1	-6.9	0.1	2.5	2.8	3.8	1.9	1.3	-0.9
No. of trees	3	8	16	14	20	42	54	56	37	38	10	5	303

These results verify Reineke's criticisms and show that this method cannot be relied upon to produce satisfactory volume tables.

Central States

Black Locust Yield. Kellogg has spent the month of April in the Washington office of Forest Measurements, analyzing the data from plantation black locust yield plots. The plots were found to contain numerous instances of groups of stems of sprout origin, which developed following injury or death of the original seedlings tops from attack by the locust borer or from other causes. Although mortality among these sprouts frequently has left only one sprout to continue in the place of the original planted tree, there are enough extra living sprouts in some instances to more than offset the ordinary expected mortality in the planting. Consequently some of the plots were found to show a larger number of black locust stems per acre than was originally planted within the plot boundaries.

Plots were grouped into those showing no sprout groups, those with 1 to 10 percent sprout groups, those 11 to 20 percent, and those with 21 percent and over of sprout groups. For initial curves, only those plots with 10 percent or less of sprout groups (consisting of about 69 percent of the total number of plots) were used. After the discard of some 34 plots which plainly had too many stems for plantings of their respective original spacings, averages for the curve of average-dominant-height over age were recomputed. The new average curve was practically identical in form to that based on all plots, but the measures of dispersion of plots around the averages of the affected age-groups were found to have increased in every case.

Central States (Continued)

Investigation of the relation of number of trees to average d.b.h. for the plots with 10 percent or less of sprout groups indicated a normal distribution of plots around the mean. For use as a standard of uniform stocking some 64 plots deviating not more than $\pm$ 0.5σ from the mean were set aside for more detailed study. Averages from 145 plots indicated that average dominant height of planted black locust is affected by density of stocking. The gross and highly significant coefficient of correlation of dominant height to original space per tree was found to be .297. Using only the 64 plots of uniform stocking, a more highly significant r (.343) was obtained. The trend was distinct and indicated an increased average dominant height of black locust trees with wider original spacing.

Lake States

Black Spruce Yield Table. A yield table for fully stocked stands of black spruce in northeastern Minnesota has been compiled by G. W. Kruse of the Superior National Forest, who has been on detail at the Station. The field data were gathered by the Superior National Forest under the supervision of Gordon Fox.

Well-stocked stands of black spruce on good site will produce 41 cords of wood when 80 years of age. The table indicates that the proper economic rotation for black spruce on good sites is between 80 and 100 years, for medium sites 100-120 years, and poor sites 120-140 years.

Pacific Northwest

Douglas Fir. Periodic 5-year remeasurements were made on the ten Rainier permanent growth sample plots in second-growth Douglas fir. In addition, the report on the 1936 remeasurements of the Olympic permanent sample plots was completed this month. An analysis of the fluctuations of site index estimates based on periodic plot remeasurements was made for the Olympic, Siuslaw, and Cascade sample plots. It was found that the fluctuations in site index for a given plot are not larger than may be accounted for by the variations of sampling and the error in height measurement. There is no evidence in the data analyzed that sample plot tree heights have in the past quarter-century departed significantly from the height-age-site index curves of the Douglas fir yield table.

The volume and growth computations on the 40 large sample plots in partially cut stands of the Douglas fir region have progressed to about two-thirds of completion.

Ponderosa Pine. Curves of normal diameter increment by age, site, and tree-class group have been constructed for the Klickitat, Yakima, and Okanogan divisions of the ponderosa pine region for use in the

growth phase of the forest survey. These curves have been compiled from data derived from the study of growth cycles in ponderosa pine.

PROTECTION

Entomology

Appalachian

June Beetle Control. Tests of June beetle control by spraying foliage of host plants was begun during the latter part of the month.

Twenty-eight trees of different species were treated with copper sulphate, each by one of the following methods: "banding", "stepping", "capping", or "dry packing". Quantitative analyses were made of many copper treated trees.

An examination of all the test sections from the 1935 treated trees was completed and some of the winter "dry packed" and "banded" pines and hardwoods were felled and examined for a study of chemical distribution.

The April and pre-leafing collections of hickory sections and starch-test samples were made for the food depletion study.

Leaf Miner' Infestation. A rather heavy infestation of a leaf miner is causing the foliage on pines along the Rice Pinnacle road on the Bent Creek Experimental Forest to take on a yellow brown cast.

Southern Pine Beetle. Four Dendroctonus frontalis kills on the South Carolina National Forest near Walhalla, South Carolina, were examined. Where the beetles had not emerged, birds, probably woodpeckers, had destroyed the brood.

White Grub Study. During the early part of the month 125 white grub test plots were seeded to loblolly pine at the Georgetown, South Carolina nursery. A series of light traps for beetle collection were set up and field surveys were begun for beetle collections from host plants.

Germination of the loblolly seeds began during the last week of April. Chafers were first collected from the light traps during the second week and from host plants during the third week.

Adults of one species of Phyllophaga emerged in a test cage infested two years ago with eggs, indicating a two-year cycle for the species.

Central States

Locust Borer. Active field work was initiated by Hall early in April on the locust borer investigation in eastern Ohio. The work for the 1937 field season is being concentrated principally on the Carnes Area at Cambridge, Ohio, although the drought shed experiment will be continued at Hopedale and thinning, pruning, spraying, girdling, and top reduction experiments will be continued at Minerva. Irrigating experiments, to study the effect of an abundant soil moisture supply on locust borer development and survival, are being initiated at Cambridge.

Locust borer larvae started actively much earlier this season than had been expected from early stages of vegetation development. This season has rapidly changed from one behind normal to one well ahead of normal. Locust borer larval development is about two weeks in advance of the 1936 season.

A ten-man C.C.C. crew, assigned from the Soil Conservation Service Camp at Carrollton, Ohio, for a two-weeks' period, started work at Minerva, Ohio, under the direction of Secrest. This crew is assisting with spraying work and miscellaneous sample plot establishment. The spraying experiment is being conducted on ten 1/10 acre sample plots in an attempt to kill all developing larvae to study what effect this has on height and diameter growth.

Northeastern

Gypsy Moth Control. As one phase of the cooperation between the Northeastern Forest Experiment Station and the Office of Gypsy Moth Control at Greenfield, Massachusetts, to work out the possibilities of extending the application of silvicultural control of the gypsy moth, arrangements were made for a Field Day on areas where demonstration control operations have been in progress to provide instruction for Camp Superintendents and foremen engaged in gypsy moth control, in the technical aspects of the job.

Of a total of nearly 60 people at the meeting, about 40 consisted of the superintendents and foremen of Civilian Conservation Corps Camps. Representatives were present from the Experiment Station, the Harvard Forest, the Massachusetts State Forestry Department, the Gypsy Moth Control Laboratory, the Division of Forest Insects, as well as representatives in charge of the gypsy moth control in the Massachusetts Conservation Department. Doctor Burgess of the Gypsy Moth Laboratory presided and spoke of the importance of maintaining the barrier zone and of the means employed in reducing the impact of the infestation against the barrier zone. Mr. Crossman, also of the Gypsy Moth Laboratory, recounted the progress made by the C.C.C. control organizations in carrying forward the gypsy moth control program. Mr. A. C. Cline of the Harvard Forest pointed out how the objectives of forestry and gypsy moth control were parallel since the both could be substantially furthered

by elimination of forest weeds which are among the most favored food species for the gypsy moth. He pointed out further that soil conditions were influenced by composition of the forest and that a reduction in the proportion of oak, which would mean an increased resistance against gypsy moth, would be beneficial from the standpoint of soil building.

Mr. Behre presented preliminary data which gave a rough idea of the proportion of forest area in Massachusetts, lending itself in varying degrees to silvicultural treatment to develop resistance to the gypsy moth. From data obtained from surveys of the Massachusetts State Forest Behre estimated that nine-tenths of the forest area west of the Connecticut River Valley was already stocked with species which rendered it dominantly resistant to the gypsy moth and that only about half the remainder could not be promptly rendered satisfactorily resistant by silvicultural treatment. Figures for the central part of the state indicate that even in this region where oak is so predominant, about one-quarter of the forest area is already of an essentially resistant type and another quarter may be readily converted to a reasonable degree of resistance.

The morning program included a trip to a demonstration area where the group had an opportunity to see stands which had been recently treated under forestry principles to increase their resistance, and to compare these with untreated stands in which the trees to be removed in the silvicultural cutting had been marked. After a discussion of the objectives and result of the marking under a variety of conditions, the group engaged in a practice marking in a portion of old pasture growth.

After lunch the party was given an opportunity to visit a stand of poplar with a fairly complete understory of white ash and white pine. This situation illustrated a condition where the removal of an overstory of favorable food species may convert the stand to a resistant condition by releasing an understory of unfavored species. The group also visited a stand of white pine saplings which could easily be rendered completely resistant by cutting out of scattered gray birch and other weed growth.

The Field Day ended by inspection of stands composed chiefly of oak and another test marking on a chestnut oak ridge where many of the trees were decadent and where the stand had been left rather open by death of chestnuts several years before. Here it was pointed out that it was hardly feasible to expect any improvement in resistance to gypsy moth by any other treatment than clear-cutting and planting. In order to take advantage of patches of coniferous understory conversion of such a stand by planting might be accomplished in groups. Such treatment, it was pointed out, would be accompanied by the hazard of defoliation should an outbreak occur while a large part of the area was still in oak.

Southern

General. Tests of finishing waxes for agricultural implement handles indicate that these waxes offer protection from attack by Lyctus powder-post beetles, although the tests are not as yet conclusive.

Examinations of several buildings at New Orleans, which termites abandoned without evident cause after effecting some damage, led to no satisfactory explanation as to why the insects stopped work. One of these buildings is 50-year-old Christ Church.

The season not being favorable, it was impossible to put in log-spray tests against ambrosia beetles at Natalbany, La., on April 19. Five chemical dips for boards were installed. The tests of sprayed lumber piles indicate that diphenyl is superior to either cresylic acid or orthodichlorobenzene.

The Lyctus powder-post beetle tests at Vicksburg were inspected on April 20-21. The test in the shed is giving results, and a number of dips (25 out of 136) have already failed. In the yard where there is very little infestation, the experiment has given no results. No exit holes of Lyctus have appeared in untreated lumber until after 13-14 months' seasoning.

Fire

Appalachian

Fire Danger Studies. A fire danger meter for determining the intensity of organization needed each day for fire suppression has been developed and is being checked against past weather records. It is planned to have this device ready for experimental use in the field by July 1. The factors integrated by the meter are amount of rain, hours since last rain, relative humidity, and wind velocity. Five danger classes have been chosen and defined by administrative officers in Region 7.

Detailed plans have been made for testing fuel moisture measuring methods developed in other regions to see if they satisfactorily indicate the moisture content of hardwood leaf litter common in the Appalachian Mountains.

Going-Fire Data. Plans have been completed for obtaining rate of spread and held-line output data on all going fires, including perimeter on arrival and corral; fuel type classification; character, volume, and arrangement of ground fuel; fuel moisture content; slope and aspect; wind, humidity, and rain; and rate of spread at intervals during the fire. One C.C.C. boy in each fire crew is to be designated as fire observer with the sole duty of obtaining this information. A trial training school for observers was conducted on the Jefferson National Forest.

California

Fire Danger Rating Studies. A portion of the Fire staff has been devoting a major part of its time to the subject of fire danger rating during the past two months. Development work in this field is being carried on by a committee of Regional Office and Experiment Station personnel. The decision has been reached to attempt fire danger ratings on a rather comprehensive basis on five forests during the present season. In the preliminary development of fire danger rating, it has been decided to attempt to rate three classes of fire danger separately: Inception danger, man-caused; inception danger, lightning; and spread danger. Visibility will be considered as a separate factor and will not enter into the numerical fire danger rating. Preparations have included the purchase of instruments for 40 stations and the preparation of a preliminary work plan of procedure. Field work on this project will begin immediately.

Lake States

Fire Studies in the Northern Hardwoods. A series of fire weather stations are being established in the northern hardwood type to secure data for the preparation of a fire hazard index which will be applicable to this type. The present index was prepared on the basis of data collected in the jack pine type only. In addition, studies will be made of the rate of spread and man hours for control in this type. The Regional Office is assisting in this study by detailing Russell Watson to work on the latter two phases.

At present several computers are engaged in working up summaries of weather conditions by 10-day periods for weather stations on and near the National Forests. These will be used to indicate what weather conditions may be expected throughout the fire season on the basis of past records.

Northeastern

Forest Insurance. Since the figures presented in last month's report were compiled, computation of rates of loss in the six sample states, on a value basis, has been completed. The resulting figures, shown below, form the true basis for premium-rate-schedule construction.

The final figure means that, for the territory as a whole, out of every $100 of forest value, 13.6 cents worth is lost each year, in the average. It is obvious that, of the forest regions, the sprout hardwood is the most hazardous, and that Pennsylvania is by far the most hazardous state, being almost twice as bad as Massachusetts, the next worst.

Northeastern (Continued)

Average Annual Rates of Loss of Merchantable Timber, Cordwood, and Young Growth in Six Northeastern States. Value Basis - 10-Year Period

Percents

Forest Regions	S T A T E S						
	Maine	New Hampshire	Vermont	Massa-chusetts	New York	Pennsyl-vania	Totals
Northern Forest (Spruce, Fir, Nor.Hardwoods)	0.096	0.011	0.017	0.054	0.012	-	0.067
Northeastern White Pine	0.063	0.092	0.073	0.177	0.010	-	0.082
Sprout Hardwood	-	-	-	-	0.081	0.364	0.274
Allegheny Hdwd. (Beech, Birch, Maple)	-	-	-	-	0.023	0.237	0.174
Totals	0.090	0.071	0.036	0.168	0.036	0.313	0.136

Values at risk were computed from volumes of merchantable growth and areas of young growth, as given in the extensive revision of the Capper Report, by combining them with average unit values of recent years. Annual-loss figures are the result of combination of the same values with average annual losses, by volume and area, as developed by the intensive loss-rate study of the forest insurance investigation.

Losses on the value basis are less than 1/3 of losses on an area basis. This is because so much of the area covered by so-called forest fires falls in scrub and waste areas where no real insurable value is involved.

Northern Rocky Mountain

Fire Research. Field work at the Priest River branch station was commenced early in April with the arrival of Hayes, Kachin, Buck, and two Jr. Assistants to Technician. The new laboratory had been made ready for occupancy and for the first time in the past 6 or 8 years adequate space was available for the calibration of wood cylinders, duff hygrometers, fuel hygrographs and the many meteorological instruments used in this work. The specially insulated room, intended for later air conditioning, proved to be remarkably uniform in temperature and humidity even without an air conditioning unit.

Due to a new Regional policy of commencing fire danger measurements on the Forests earlier than in the past the load of work to be done before May 1 was greatly increased. With the aid of the new

Northern Rocky Mountain (Continued)

laboratory and its facilities, however, this extra work was handled even with the reduced personnel due to Jemison's transfer.

Seventeen assistant supervisors or fire assistants, one from each National Forest in Region One, were given one-half day of training in fire danger measurement while they were all assembled attending a Regional meeting. They were taken to a model fire danger station at Bonita Ranger Station on the Lolo Forest, 23 miles from Missoula, and shown the proper ways of measuring each fire danger factor. They were then coached in the proper assembly of such data within a ranger district, and of all districts within a Forest, in order to compute the district and the Forest danger classes consistently.

With several new stations to be established on the eastern Montana Forests during 1937, Region One will be able this year for the first time to rate the character of fire season for the entire Region.

Pacific Northwest

Fire Studies. One of the major accomplishments of the month was the production of 100 fire-danger boards, one for each district ranger in Region 6, and a master board for each supervisor's office. These boards were designed and their production worked out in close cooperation with the Regional Office of Fire Control. The boards show by a striking color scheme the current condition of various fire-danger factors, and by means of simple integration tables these factors are combined to make one of seven classes of day. In addition to riding herd on the production of the boards, Fire Studies' personnel assisted in rewriting sections of the R-6 Guard Handbook and Fire Control Handbook dealing with fire-danger rating. Assistance was also given in producing several forms for use as a part of the fire-danger rating scheme.

Tentative instructions and specifications for extensive fuel type mapping in Region 6 were drawn up.

Southern

Visibility. Preliminary analysis of Byram hazemeter readings taken from the central lookout tower on the Biloxi District of the DeSoto National Forest indicate that visibility is greatest, on the basis of number of days, when looking north and least when looking west. Approximately 1,700 readings were recorded during the peak fire season of January to April. These comprised six readings daily, taken at 2-hour intervals between 8 a.m. and 6 p.m., in each of the four cardinal directions.

Southern (Continued)

The visibility distance in miles looking in each cardinal direction is shown, by percentage of days that such distances are visible, in the following table:

Percent of days	Visibility distance in miles looking			
	North	East	South	West
100	1.6	1.3	1.3	1.0
90	2.4	2.3	2.1	1.6
80	3.2	3.1	2.6	2.2
70	3.6	3.4	3.1	2.5
60	3.9	3.8	3.4	2.9
50	4.2	4.1	3.6	3.2
40	4.6	4.5	3.9	3.6
30	5.1	4.9	4.3	4.0
20	5.6	5.4	4.7	4.2
10	6.1	6.2	5.2	4.5

Similar tables will be made for each 2-hour interval throughout the day.

Pathology

Allegheny

Nursery Diseases. Dr. Jackson and Mr. Wean have concentrated on manuscript preparation.

Decay of Sprout Hardwoods. Their manuscript on "Decay in sprout oak stands" was completed in rough draft by Dr. Sleeth and Mr. Roth. Material collected at Camp Ockanickon was dissected in a study of sprout origin, latent buds, and bud traces. In making up a program for the coming year, cooperation with the Forest Service in pruning studies at Loch Raven is planned.

Mycorrhiza. Summaries in the form of memoranda were prepared on the mycorrhiza studies done at Denbigh and Bottineau nurseries in North Dakota and the soil inoculation experiments for 1936 at Towner, North Dakota nursery. These were sent for the information of cooperators at the Lake States Forest Experiment Station who are continuing the work on a larger scale in 1937. Mycorrhizal conditions as related to growth of stock have been summarized for nurseries at Harrisburg, Illinois; Valonia, Indiana; Savenac, Montana and others in Texas, Oklahoma, Kansas, and Nebraska.

A manuscript concerned with pot and nursery inoculation at Mont Alto, Pennsylvania, through cooperation with Professor George Perry was

Allegheny (Continued)

prepared. Time was spent in aiding graduate students, who are working on phases of the mycorrhiza project, in preparing manuscripts as follows: (1) A. G. Lisi, "Morphology of compound forms of mycorrhizae", proposed for publication in American Journal of Botany, (2) M. Barenbaum, "Seasonal sporophore production and mycorrhizal habit of soil Hymenomycetes and Gasteromycetes", proposed for publication in Ecology.

Southern

Stains. Isolations made from stained wood collected at several mills in Louisiana were chiefly Ceratostomella and Endoconidiophora. This work is to continue throughout a complete year to determine possible seasonal variations in staining flora since previous dissemination studies have disclosed that certain other stain fungi heretofore considered minor are in preponderance in the air.

The first bulk-piling test indicates that fresh lumber dipped in the commercial stain-control chemicals will remain bright when bulk-piled for periods up to 30 days. This material is now in a seasoning pile for further observation.

GENETICS

California

Hybridization. This year the Institute will attempt to effect the following hybridizations:

P. echinata x P. caribaea
P. echinata x P. palustris
P. echinata x P. taeda
P. taeda x P. caribaea

The work, which is now under way, will be restricted to a few pollinations for each cross and the necessary checks. Several lots of viable pollen to be used in this work have been received from the Southern Station; additional pollen has been collected at Placerville.

Germination tests of the pollen received from the Southern Station indicate, as have previous tests of local pollen, that the fungous infestations that are encountered occasionally in germination tests result from fungi which are attached to, or mixed with, the pollen rather than from contaminations which have been admitted through imperfect technique. Such contaminations may result from dissemination of the spores by insects which feed on the pollen.

California (Continued)

Equipment is now being designed for applying heat treatments to the year-old conelets for the purpose of inducing amphidiploidy in species hybrids. Some of the flowers to be pollinated this year will be subjected to such treatments at the time of fertilization, a year hence. Material for cytological study is being collected from several species in the Institute's arboretum.

On account of the magnitude and complexity of the Progeny Test nursery now being sowed at the Institute, it was decided to postpone until another year the previously planned series of transect nurseries at different elevations in El Dorado County.

Unusually heavy snowfall at the Institute during the past winter caused injury to a number of trees in the arboretum, and served to bring out very strikingly the varying susceptibility of different species to damage of this type. Recently records have been completed showing the extent and nature of the injuries. The following species are among those that have been found least able to withstand the weight of heavy snows: Pinus palustris, P. caribaea, P. radiata, P. leiophylla, P. pinaster, P. muricata, P. halepensis, and P. rigida.

Northeastern

Vegetative Propagation by Chemical Treatment. Rooting of white poplar hybrid cuttings, which root with difficulty under ordinary conditions, was found to be somewhat increased by treatment with growth promoting substances. On the other hand, such treatment has to date had no apparent effect on cuttings of red and sugar maple. Cuttings of these species planted in the greenhouse bench have not rooted although sufficient time seems to have elapsed for the appearance of root initials.

Cytology. Considerable time was spent during the past month on cytological investigation of pollen tube penetration through the pistils of flowers of forest species. Most of this work has been in the nature of developing suitable technique. Pollen germination has been observed on the stigma and the pollen tubes apparently penetrate the stigmatic surface, but their course through the pistil has not been clearly defined in the preparations so far obtained.

Hybridization and Breeding. The elms were the first species to bloom, but it was impossible to make any hybridization on these trees. An American elm and an exotic elm were self-pollinated and have apparently set some seed.

The major part of the time during the month of April has been spent on this work. The red and white maples are past bloom, and a number of cross-pollinations have been made on these two species, as well as self-pollinations of individual trees. The Norway maple

Northeastern (Continued)

is likewise past bloom, and has been self and cross-pollinated. Sugar maple is now in full bloom, and will be self- and cross-pollinated.

The birches are practically past bloom; cross-pollination and selfing of most of the available species have been completed.

Extreme dichogamy has been apparent in the maples. Occasional trees were found whose flower behavior would allow for some self-pollination.

Oxford Poplar Hybrids. Work has been started at the Oxford Nursery, and Mr. Stephen Lawler has been hired to handle the nursery work in the capacity of nursery foreman. The poplar stools are being cut back so that they will produce a maximum of nursery stock for experimental planting in the spring of 1938.

RANGE MANAGEMENT

Intermountain

Forage Inventory of Non-Forest Ranges in Utah. Previous "spot" surveys over much of the state have yielded valuable information as to degree of range deterioration and condition of plant cover, but were too incomplete to give an inventory of total range resources. The Utah Cooperative Range Survey, conducted during 1936, "filled in" in counties which had been previously "spot" surveyed, and completely surveyed other counties so as to cover the entire non-forest ranges of the state except for a few centrally located counties which are primarily agricultural.

The Forest Service (Administration Region 4 and the Intermountain Forest and Range Experiment Station working jointly) had five 2-men parties in the field last fall, two crews working in western Utah and three crews covering the eastern counties not covered by other cooperating agencies which surveyed all of Duchesne and Uintah Counties and parts of Carbon, Emery and Grand Counties. For field operations, the state was divided into large geographic units, which included all or parts of several counties, to which a survey crew was assigned. These large geographic units were further broken down to management or operation units, insofar as this information could be determined by the surveyors, and the units broken into major vegetative types which were the basis of sampling. In sampling the vegetative types within units, 3 to 15 transects with a minimum of ten "point-observation-plots" per transect were taken. The number of transects taken in any major type was dependent upon the extent and uniformity of the type, a sufficient number being taken in each to give what was deemed a nearly true

average of the plant cover. In building up the unit the plant types were weighted by the percentage that each made up of the whole unit. Historical notes on range use and also notes on erosion intensity and other range conditions were taken for each transect and type.

The compilation of the field data was summarized in two ways: (1) by range units as taken in the field, and (2) by counties. In order to adjust the range units, many of which extended into two or more counties, to nearly correct acreages it was necessary to compile the data by counties adjusting the several units or portions of units to county acreages. This was necessitated by the fact that accurate base maps were not obtainable for the state and counties from which acreages could be determined by planimetering within reasonable limits of accuracy.

The completed survey data gives the total forage acres and total range lands available for grazing for each of the counties covered by the survey and also for the 63 range units comprised therein. This information should be useful as a basis for evolving management plans for non-forest ranges similar to those now in use on national forests. While the degree of coverage used in this survey is not sufficient to give accurate forage acreage determinations for local areas and cannot be so used, it does give an inventory of range resources and a general picture of range conditions which can have wide application in working out plans for the better use of management and geographic units on range lands of this type where grazing values will not justify the expense for intensive range surveys as are made on national forests.

General Range Forage Type Map of Utah Completed. A generalized range vegetation type map has been completed for Utah ranges outside the national forests. The regular detailed type maps are available for the national forests except for a few small areas. Since in the near future no opportunity seemed likely to present itself for obtaining detailed type maps of the non-forest ranges and also since the vegetation types were actually much broader than on the forests, the more generalized range vegetation maps were built up as opportunity arose. Central and western Utah were surveyed in such a manner during 1930 and 1932-34 as to yield depletion data which proved valuable in reporting range conditions and in encouraging surveys in other regions to be made. The Forest Service, the Utah Agricultural Experiment Station, Resettlement Administration, the T.C.B.I.A., and the Division of Grazing took part in this survey.

The following major range vegetation types appear on the map: (1) sagebrush, (2) sagebrush-grass, (3) pinyon-juniper, (4) pinyon-juniper-grass, (5) pinyon-juniper-blackbrush, (6) aspen-brush, (7) mountain brush, (8) shadscale, (9) shadscale-grass, (10) shadscale-blacksage, (11) Nuttall's spineless saltbush, (12) mixed saltbushes, (13) blackbrush-shadscale, (14) grassland, (15) grassland-blackbrush, (16) greasewood and waste, (17) creosote bush, (18) national forests, and (19) cultivated land.

FOREST INFLUENCES

Allegheny

Flood Control. As the representative of the Department of Agriculture at a public hearing on the Patuxent River, Maryland, Forbes was cordially invited by the Army representatives to participate in the questioning of witnesses. This is the only hearing in our territory on streams named in the Flood Control Act of 1936 which had not already been completed by the War Department.

At a meeting in our Philadelphia office with representatives of the Soil Conservation Service and the Bureau of Agricultural Economics a very satisfactory division of jobs was agreed upon in the flood surveys for this territory.

Observations of frost penetration, snow depth, and soil moisture were continued by ERA crews at four Branch Stations. They were made under about ten different conditions of vegetative cover at each Station.

Appalachian

The 120° V-Notch Weir. Tests conducted at the testing station on the Coweeta Experimental Forest show that the 120° V-notch weir is a practical and accurate device for measuring small stream discharges. Where the run-off does not exceed 100 cubic feet per second per square mile, this blade can be used for watershed areas varying in size from a few acres to 150 acres, without excessive heads over the blade. The wide angle of the V-notch produces a discharge of 24.43 cubic feet per second for a 2-foot head as compared to a discharge of 13.96 cubic feet per second at the same head on a 90° V-notch. This increase of 75 percent in the capacity of the weir makes the 120° V-notch adaptable to many uses for which the 90° V-notch is too small. The calibration tests on the 120° V-notch weir show that accuracy at low heads can be obtained even though there is adherence of the nappe to the blade at all heads below approximately 0.8 feet. This adherence, which has been considered objectionable, affects the accuracy of the discharge if general V-notch formulae are used in connection with a 120° notch, but the objection is removed when a formula is developed for a specific blade. The 120° V-notch weir has been exceedingly useful in forest influence investigations where a wide amplitude in the range of the discharge is expected and accuracy of measurement is imperative throughout the range in order to obtain both low flow and flood flow data. A detailed report of the formula derivation will be prepared in the future.

California

San Dimas Experimental Forest. Research progress is being accelerated with the advent of clear weather and eight Junior Assistants to Technician. Two, working with Storey, are overhauling all gaging stations. Two, under Colman, profiled the surface of all the large lysimeters to establish the zero plane for measuring soil settling. Since then they have been learning technique in soil analysis by working with Theriault in the Tanbark soils laboratory. Horton is training two men in botanical work, and on the side they are learning storm-recording technique. The rest of the Junior Assistants are working on the climatic stations with Hamilton and overhauling rain-gage and other installations.

In the soils laboratory the staff has been developing a modification of the standard (Bouyoucos) mechanical soil analysis procedure so that it will work properly for the highly organic soil eroded from the SRE and WEC plots. An analysis method, based upon this study, should be ready for use within a week, at which time a start will be made on the mass of samples (over 200 SRE and WEC samples and 800 lysimeter samples) now in the laboratory.

Erosion Control. The large cut slope north of the lysimeters at Tanbark Flat on the San Dimas Experimental Forest has been completely controlled by brush wattle and hay cover treatment. After completion of the mechanical control measures, 461 potted shrubs consisting of 20 different native chaparral species were planted on the slope and 8 pounds of chaparral seeds spotted over the area. An eight-foot fence has been constructed around the slope to protect the control work from deer damage.

Intermountain

Erosion Control Studies on the Boise Basin. Early spring observations on experimental erosion control plot areas at the Arrowrock substation near Boise, Idaho indicate there is a good possibility this year of getting a check on the effectiveness of artificial reseeding for erosion control purposes. Last fall the erosiveness of fifty-four 1/200-acre plots was tested with portable rainfall apparatus, then reseeded. Examinations made this spring revealed that favorable germination and initial height growth has occurred on all plots, indicating good prospects for a recheck with the rainmaker apparatus later in the season. This study is being watched with considerable interest since it will have a direct bearing on the direction and scope of artificial reseeding operations aimed at controlling erosion on depleted range lands in southern Idaho.

In another phase of erosion control work at the Arrowrock substation, 2,000 shrubs are being planted this spring on contrasting aspects and in a system of plowed furrows to determine the feasibility

Intermountain (Continued)

of using this type of material for checking gully erosion. Four species from Utah are being used in these tests, including the Utah juniper, oakbrush, mountain mahogany and squaw-bush, as well as four shrubs of similar growth form from Idaho and seedlings of ponderosa pine and Douglas fir.

Lake States

Effect of Artificial Wind Barriers. On April 24 an unusually strong and steady wind blew at Huron, South Dakota. The direction of this wind was almost exactly at right angles to the artificial barriers. Since the Station had approximately 100 anemometers in position at the time, it was possible to get a very clear-cut picture of the "field of protection" afforded by such a barrier. It was found that in a position well in from the ends of the barrier, the wind velocity at a distance of 30 times the height was 90 percent or less of that in the open; at 16 times the height, 67 percent; at 12 times the height, 50 percent; and at 3-5 times the height, only 26 percent.

Pacific Northwest

Flood Control. The flood control hearing for the Chehalis River was held in cooperation with the U.S. Engineers. Andrews represented the Director and presided over that part of the hearing dealing with land use procedures. He was accompanied by Mr. J. W. Smith, Regional Water Utilization Specialist, of the Resettlement Administration.

A meeting was held with Messrs. Selby and Smith of the Resettlement Administration, at which possibilities of the breakdown of the work involved in preparing preliminary flood control reports were discussed.

During the month folders for each flood control project were set up and special mounted forest survey maps of each drainage district were prepared. The drainage projects as specified by the Flood Control Act were designated on one large regional map. A check of the drainage area figures supplied by Washington and also those used by the Army Engineers was made by comparing them with drainage area figures compiled from the G.L.O. plats and used in the Forest Survey compilations. The outline for flood control reports was checked against certain of the House document reports by the Army Engineers to determine what sections of the outline had been covered by Army Engineer reports. Also a check-up was made on the percentage of each drainage covered by U.S.G.S. topographic sheets.

FOREST PRODUCTS

California

Logging and Milling Studies For Redwood. The sawing-time curve for redwood logs in the Dolbeer and Carson Lumber Company study when plotted as minutes per M.B.M. gross Spaulding Scale over log d.i.b., comes very close to being a perfect arc between the 20 and 90-inch points on the Y axis. Converted to time per M.B.M. lumber tally, however, the curve begins a skyrocket ascent at around 75 inches d.i.b. because of the increasing amount of defect and the fact that the largest logs go on the headrig as split sections of the original. The average length of 20-inch logs was about 30 feet, from which point it gradually diminished to an average of 17 feet for 90-inch logs. Curved sawing time data and average underrun based on gross scale are tabulated below:

Log d.i.b.	Sawing time including prorated delays		Average underrun, green chain tally under gross Spaulding scale
	Gross scale	Mill tally	
Inches	Minutes per M.B.M.		Percent
20	6.09	7.79	21.8
25	5.88	7.63	22.9
30	5.67	7.50	24.4
35	5.47	7.40	26.1
40	5.26	7.31	28.0
45	5.05	7.21	30.0
50	4.85	7.13	32.0
55	4.75	7.10	33.1
60	4.64	7.03	34.0
65	4.64	7.11	34.7
70	4.85	7.47	35.1
75	5.05	7.83	35.5
80	5.36	8.36	35.9
85	5.78	9.07	36.3
90	6.09	9.61	36.6

Northern Rocky Mountain

Logging and Milling Studies. Computational work on the Idaho white pine logging and milling study is 95 percent complete with the manuscript 90 percent complete. Both should be finished by June.

Is it generally true that the mid-logs in a conifer tend to have straighter grain and more uniform texture than butt logs or top logs? This is indicated for white pine. Straight grain and soft, uniform texture are primary requirements for match plank. Larger yields of plank are obtained from mid-logs, especially third logs, than for logs in other positions. This is shown in the following table. Could a general recommendation be made to wood carvers and others who require

uniform-textured, straight-grained wood to look for it in the mid-logs? Undoubtedly.

Percentage of match plank produced by logs of different positions in trees of different heights.

Log position in tree	Yield of match plank for height indicated		
	5-log	6-log	7-log
	Percent	Percent	Percent
B	44	53	52
2	69	75	75
3	78	82	93
4	73	72	72
5	56	60	78
6		29	69
7			13

Based on trees 17 to 20 inches in diameter breast high.
Yield of plank expressed as percent of green-lumber tally.
Height of tree is expressed as number of 16-foot logs in utilized bole.

Prices. Montana and northern Idaho produce over one million ties annually. Consequently price trends are of considerable interest and value to stumpage owners. The three transcontinental railroads traversing Region One are now paying the following prices:

	Price per M.	
Great Northern	$ 9.80	On right of way
Northern Pacific	$13.00	On right of way
Chicago, Milwaukee, St. Paul & Pacific	$13.50	F.O.B. car

Only grade 3, 4, and 5 sawed ties are being purchased and little difficulty is being experienced in letting contracts at these prices.

Wood Preservation. Dr. J. D. MacLean, Senior Engineer, of the Madison Laboratory spent April 22 to 24 in Missoula. Conferences attended by members of the Regional Engineering staff in charge of various types of construction work, representatives of this Station, and W. L. Powell, Engineer in charge of pole purchases and standardization of equipment for the Montana Power Company, were held with Dr. MacLean.

In starting the use of fire-killed western red cedar poles by the Montana Power Company, Mr. Powell is interested in obtaining a Forest Service timber sale contract covering 35,000 to 40,000 fire-killed poles from 30 to 55 feet in length. For this reason he was intensely

Northern Rocky Mountain (Continued)

interested in the information furnished by Dr. MacLean regarding temperature conditions and treating schedules necessary to kill wood-destroying fungi in the event concealed heart-rot or incipient decay should be present in this material. The answers given by Dr. MacLean to many other questions will have considerable bearing on the work of Regional Forest officers, especially where new construction projects are being started and where treating work by use of non-pressure process is being carried on.

Pacific Northwest

Lumber Census. Lumber census returns are coming in slowly as is the usual way toward the end of the canvass. To date 1,368 acceptable schedules have been forwarded to Washington.

Log Depletion. Johnson spent considerable time segregating the 1925-29 log depletion for western Oregon into years. Constant requests for information as to individual years prompted the breakdown. Before certain county figures can be released it will be necessary to obtain releases from certain large companies because of Census Bureau regulations.

Mill Production Studies. Lodewick with crew spent three days at the Kinzua Pine Mills Co. obtaining additional data on the large diameter of Grade 1 and 2 logs and Grade 6 logs. At the time of the original study in the summer of 1936 no large logs were available. Records were obtained on 162 logs. These additional data will permit the early completion of the Kinzua study.

Beginning about May 3 a similar study will be initiated at the mill of the Brooks-Scanlon Lumber Co. at Bend, Oregon. The study logs will be obtained from mature ponderosa pine stands, marked for about a 50-percent cutting, typical of the company's operation. Records will be kept on about 1,000 logs. This study is a cooperative one with the Regional Office and the company.

Johnson and Anderson made a trip to Bend to look over the Brooks-Scanlon mill to determine the crew needed and the mechanical details necessary to the success of the study.

FOREST ECONOMICS

LAND USE

Pacific Northwest

Planning. Wilson, as chairman of the Land Resources Division, presided over the Land Section program of the Pacific Northwest Regional Planning Conference at Boise on April 9, and spoke briefly on the importance of cooperation in land use planning. This section dealt largely with interrelations in the use of lands, including the relation of forest to grazing and agriculture in a regional program.

What to do about the continued flow of settlers from the "dust bowl" to the Northwest was the subject of conference among representatives of the Regional Planning Commission, the State Planning Commissions, the Resettlement Administration, the U. S. Engineers, and the Forest Experiment Station. These settlers are pressing for farms and for jobs in industries. There being limited opportunities for acquiring going farms and immediate occupation in factories, many of these settlers are pressing for "cheap lands", most of which are in stumps and undesirable for farm purposes under normal standards of living. The problem was considered sufficiently serious to warrant a brief regional study and report on its extent and possible ways of meeting it, including an analysis of reclamation projects.

Taxation. The detailed study of Skamania County, Washington, was begun. This county may be described from the standpoint of taxable resources as principally a shoestring of farm and resident ownerships, 50 miles long and 3 miles wide, extending along one side of the Columbia Gorge. One-half of the tax base of this shoestring consists of railroad and other public utilities passing through the Columbia Gorge and connecting eastern and western Washington. The timberland tax base, consisting of railroad grant lands located from 30 to 60 miles northwest of the shoestring settlement and separated from it by a solid band of public lands, contributes more than one-fourth of the property tax income of the county.

At Boise, Idaho, DeVries prepared the following resolution on taxation, which was adopted by the Pacific Northwest Regional Planning Conference:

> "Taxation should influence land use to a minimum degree and should not force the breaking up of property holdings. This can be accomplished if both farm and forest land owners will unite in bringing about an improved administration of the present property tax laws, particularly the installation of sound assessment methods, and more efficiency in local government through the adjustment of its organization to the land use pattern of the territory served."

Southern

Reduction of New Public Domain in the South. Field work on Craig's study of tax conditions in the Yazoo Delta of Mississippi was completed on April 17 and the data have been tabulated and compiled for preliminary analysis.

One feature of the study, which is of interest particularly in the New Public Domain activities of the Station, is the very marked reduction in the area held by the State of Mississippi for non-payment of taxes. Owing to the large cotton crop of 1936, coupled with the high price obtainable, which averaged for the Delta counties around 14 1/2¢ to 14 3/4¢ per pound, the farm income of the Delta was higher for 1936 than for any year since 1926. This income, coupled with federal benefit payments, permitted the patenting under tax title from the State and the redeeming of large areas of land which had been in state title as of January 1, 1936. The total extent of this reduction could not be obtained in all counties, but in the counties studied; namely, Tunica, Coahoma, Quitman, Washington and Issaquena, it is estimated that fully 60 percent, and in some counties as high as 85 percent, of the tax-forfeited area has now been restored to the tax-roll. In Washington County, and to a lesser extent in Quitman County, large areas of cut-over forest land which had lain in state title for 5 to 10 years have now been patented by individual farmers and are being put into crop for 1937. In Washington County, in fact, the area of tax-forfeited forest land, all of which incidentally was cut-over, which now remains in state ownership, is probably less than 1000 acres.

While detailed data are not available for the other states of the South, reports from state officials indicate that a similar trend obtains throughout the Station territory. This is particularly true in the states of Louisiana, Alabama, and Georgia, as well as Mississippi. This trend indicates that, as has been said before, the depression in the prices of forest and farm crops, together with "tight money" has been largely responsible for much of the tax delinquency in the South. On the other hand, there is abundant evidence that high taxes, particularly in the Yazoo Delta area, were originally responsible for much of the forfeiture of the forest area, it being the practice of the forest land owners to remove all the stumpage which was merchantable, even for by-products, and then sell the surface if possible, or if not, allow it to revert to the state for taxes. As has been pointed out in previous monthly reports, this procedure in ownership was almost mandatory upon the timberland owners owing to the confiscatory taxes levied on forest land, particularly for drainage purposes.

LOGGING

Central States

Tractor Logging. Worthington, recently from the Southern Station, spent the month of April on detail in Washington at the office of Forest Measurements analyzing data from the tractor project of that Station.

The analysis of the tractor experiment at the Jackson Lumber Company of Lockhart, Alabama, is practically complete. Computation is under way for the experiment at the Brooks-Scanlon Corporation of Foley, Florida. Work is proceeding on the correlation of board foot-cubic coot ratios with tree diameter and merchantable log length. The Bruce-Reineke method of alinement chart correlation is being used to correct for curvilinearity found in the first approximation. These ratios are required to convert tractor skidding cost per 100 cubic feet of wood content into terms of board feet for various tree sizes and distances.

Pacific Northwest

Selective Timber Management in Ponderosa Pine. An experimental light maturity selection cut was undertaken last month by the Brooks-Scanlon Lumber Company at Bend, Oregon. Two sample plots were set aside for this purpose, one a 40-acre and the other an 80-acre area, each being fairly representative of timber types in which the company expects to operate during the next few years. The timber was log-graded and appraised by this section and then marked with a view to removing in the first cut approximately 50 percent by volume, primarily the high-value overmature trees. The logs from this cut are now going through the Brooks-Scanlon mill where a complete grade and volume tally of the timber produced is being kept by the company. Following the completion of this cut the remainder of the timber will be logged and run through the mill in the same manner, so that a comparison will be had, showing differences in average production costs, lumber values, and net stumpage realization. In addition to this simple mass test of several thousand logs, a detailed mill study test conducted by the Section of Forest Products is under way in which approximately 1,000 logs of different grades and sizes will be followed through the mill for a log-by-log analysis of lumber grade recovery.

This study may prove to be the prelude to important changes in cutting practice in the Bend area in which both the company and the Forest Service, represented by the Division of State and Private Forestry, are interested. If the present test proves successful the possibilities are that after further detailed study of the timber stands involved, a cooperative agreement may be worked out whereby the company would take only a light cut of overmature timber on its own lands and exchange their residual stands for overmature timber on adjoining national forest lands.

FOREST SURVEY

Appalachian

Piedmont Plateau and Coastal Plains, North Carolina. The field work in survey unit No. 3 in North Carolina was completed early in April. This unit of 10,395,000 acres includes the entire Piedmont Plateau area of the state. A total of 12,763 plots were tallied, of which 5980 or 46.9 percent were forest plots. This compares very closely with the 47.8 percent forest plots tallied in the Piedmont unit of South Carolina.

Following completion of unit No. 3 the crews moved to unit No. 1, the first of the two coastal plains units to be worked. In the latter part of the month heavy rains and high water in the coastal rivers and swamps delayed work in the new unit and necessitated a number of temporary skips in the lines.

James W. Girard arrived on April twenty-second to spend several weeks in the field, checking crews, inspecting logging operations, and checking volume tables against actual utilization in commercial practice.

Lake States

Big Fork Project. Cunningham and Moser have had several conferences with Hamel, Walley, and Stott, of the Division of State and Private Forestry, Milwaukee Office, and with the State Forester of Minnesota, relative to the Big Fork project - a cooperative study aiming to build up a sustained yield plan for the state and private timberlands included in a 750,000 acre tract in northern Minnesota. The report and management plan are nearing completion.

The Station's contribution has been primarily in the economic phases of analysis and in consideration of effects on local government. Moser has made a rather complete study of the effect of taxation on private management and the possibilities of changing the tax system. It appears that the average annual yield of timber from the unit is worth about 25 cents per acre per year, whereas the average tax on private lands is 46 cents. Clearly no permanent private forestry is possible under such a condition.

Long Range Acquisition Program. Cunningham spent several days in Milwaukee during the latter part of the month, conferring with supervisors and members of the Office of Lands on the Long Range Acquisition Plan which has for its purpose the location of the ultimate forest boundaries in the Lake States region. The statistics and maps prepared by the Station's Forest Survey were found to be of great help.

Northern Rocky Mountain

Reports. The statistical report for Pend Oreille County is ready for release, pending final approval. The report for Spokane County is in rough draft, and some work has been done on the report for Stevens County.

Field Season. It is planned to start the field mapping on May 15. Four regular men supplemented by four new men will constitute the crew.

The adjustment cruising crew will consist of five men. Every effort will be made to complete the check cruising during the current year so that these men will be available for mapping in 1938.

During the past month the growth crew conducted a field examination of partially cut-over areas in Spokane, Stevens, and Pend Oreille counties in northeastern Washington, for the purpose of estimating the average number of years since cutting. Information such as this is required before growth estimates can be completed for the above-mentioned counties because number of years since cutting is one of the factors controlling growth rates of residual trees. Number of years since cutting was determined by a count of growth rings on increment cores between the bark and point of acceleration which usually follows the removal of adjacent competing trees. In other cases the number of years since cutting was determined by the total age of seedlings, by the difference in age of stumps and nearby trees, or by inquiry from informed residents.

A total of 140 stands were examined from which county averages were computed as follows:

County	Number of stands examined	Average period since cutting
Spokane	57	17 years
Stevens	49	19 "
Pend Oreille	34	13 "

Logging operations began in these counties as early as 1880 and by 1915 the greater portion of timbered area had been cut over. Obviously if the averages had been based on the original cutting dates, they would have approximated 30 years rather than 20. However, second and third cutting which occurred at later dates are now influencing growth rates of these stands. This is especially true on areas adjacent to metropolitan centers and agricultural regions where cordwood cutting is common. The computed averages are based on a random sample of all these cut-over areas and include samples of early and late cuttings.

That Pend Oreille county shows an average period of only 13 years as compared to the 17 and 19 year averages for Spokane and

Northern Rocky (Continued)

Stevens counties, respectively, may be explained by the fact that practically all the originally cut-over areas either were clear cut or were later clean burned by accidental fires.

Pacific Northwest

East Side of Oregon and Washington. Colored copies of the 1-inch-to-the-mile county type maps were prepared for the Forest Supervisors of several eastern Oregon national forests. County reports on forest statistics for Ferry County, Washington, and Morrow County, Oregon, were completed and distributed.

Douglas Fir Region. The growth chapter of the regional report was revised and completely edited. Andrews gave a radio talk, "The Work of the Forest Survey", on the Western Farm and Home Hour.

Southern

Publications. April was an especially busy month for the Southern Forest Survey. Survey Release No. 25, "Sawmills in the Lower South", by H. F. Smith, was completed and is being mailed out. The North Louisiana Delta Report on Louisiana Unit #1 has been forwarded to Washington for comment, and the Texas Unit #1 Report will also soon be ready for critical review. Two articles were prepared and forwarded for inclusion in the Naval Stores Year Book; and a Sub-Unit Report of the Cave Springs, Georgia area was prepared for the Regional Office at Atlanta, Georgia.

Drain and Industrial Studies. Preliminary figures on employment in the forest industries of Georgia were tabulated and are summarized below:

Labor required to produce forest products in Georgia.

Industries or commodities	10-hour Man-days of labor		
	In the woods	In plants and offices	Total
Sawmills	643,000	994,000	1,637,000
Veneer	124,000	234,000	358,000
Crossties	329,000	-	329,000
Fence posts	196,000	-	196,000
Fuelwood	5,056,000	-	5,056,000
Misc. forest products	171,000	161,000	332,000
Naval stores	4,650,000	436,000	5,086,000
Total	11,169,000	1,825,000	12,994,000

Southern (Continued)

The proportion of the cuts from old-growth logs in the several pine regions by sawmill capacity classes is as follows:

Capacity Classes	Naval Stores Region	Pine-Hardwood East	Pine-Hardwood West	All Pine Units
	Percent	Percent	Percent	Percent
40+	84	77	62	75
Under 40	48	47	32	35

Interpretative Section. Inventory estimates were made for the states of Louisiana and Mississippi to be used in papers presented by Mr. Demmon in each of those states. Figures for Louisiana indicate that the 16 million acres of productive forest land bears slightly over 29 billion board feet (Doyle), whereas a similar forest acreage in Mississippi bears slightly more than 24 billion board feet. In addition to the sawlog material there are approximately 62 and 58 million cords of wood in sound trees under-sawlog size in the respective states. Louisiana has 387 sawmills, while there are 2,016 in Mississippi. Almost 1900 of the sawmills in Mississippi have a daily capacity of less than 20,000 board feet. Some 263 of the mills in Louisiana fall in a similar size class.

In preparing material for a recent pulpwood conference, compilations were made on the basis of three sub-regions, each of which approximated 40 million acres gross and contain around 20 million acres of pine types. This is the largest area which we have as yet analyzed from the standpoint of increment and drain, and the following figures are preliminary:

	Southeast Region 1/	Central Gulf Region 2/	Pine-Hardwood West Region 3/
	Thousand cords		
Growing Stock 4/	140,527	119,512	152,785
Increment	4,110	6,776	8,943
Drain	4,162	7,644	7,501

1/ S. C. #1, Ga. #1, Ga. #2, Ga. #3, Fla. #1.
2/ Fla. #2, Ala. #1, Ala. #2, Ala. #3, Miss. #4, La. #4, Miss. #3.
3/ Tex. #1, Tex. #2, La. #3, La. #5, Ark. #3.
4/ Growing stock includes the volume in good trees 5-inches and larger in diameter at breast height to a 4-inch minimum top stem diameter.

Naval-Stores Region. Two articles were prepared during the month for inclusion in the Naval Stores Year Book. An article on "Gum Naval-Stores Operations of 1934-35, their Size and Distribution and the Employment provided by them", brought some of the data contained in Release No. 17 up to the naval stores season 1934-35, and

added employment data. These data indicate that some 46,000 men, including those engaged in supervision, were employed in the production of gum naval stores. Over 90 percent of these were employed in the woods in the production of the crude gum.

Eldredge and Ineson prepared an article on "The Supply of Second-Growth Naval Stores Timber", which comments on the future chances of attaining three principal objectives during the next 10 years from operations in second-growth alone. First objective is the annual production of 600,000 naval stores units which is somewhat larger production than at present. Second objective is to provide material the woods products industries will need annually from second-growth longleaf and slash pine for lumber, ties, poles, piles, wood pulp, fenceposts, fuelwood, and other wood products. Third objective is to determine what surplus will remain to build up growing stock so that future operations increase in size and scope. Analysis indicates that during the next 10 years, unless there is an increase in industrial use including demands of the new pulp mills, that for the region as a whole approximately 25 percent of the trees which become 7 inches and larger each year can be reserved to build up the growing stock in the naval stores region. The article points out that the situation is not nearly as satisfactory in several of the survey units and it is recognized that our present survey data does not enable one to analyze the situation of small communities.

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Lake States

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